THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF FISH AND GAME
MARINE RESOURCES OPERATIONS

REPORT FOR THE MONTH OF FEBRUARY 1965

The southern California sardine-mackerel fleet resumed fishing on February 22 after being tied up since before Christmas.

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Three new partyboats in the 75-85' range are being built in Costa Mesa. They will be ready for the southern California summer season.

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Flood-caused pollution has prevented oyster harvesting in Humboldt Bay so far.

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An English sole, tagged in 1963 off Santa Barbara, was recaptured off Morro Bay.

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By month's end, 150 California halibut had been tagged off Ventura as part of a trawl trip made by the ALASKA.

Report on Creel Survey Workshop
Southeastern Cooperative Fish and Game Statistics Project
North Carolina State College
17-19 February 1965

This workshop on creel survey techniques and problems was sponsored by the Southeastern Cooperative Fish and Game Statistics Project under the direction of Professor Don Hayne of the Department of Experimental Statistics, North Carolina State College. The project, initially organized through the Southeastern Fish and Game Commissioners' Association, is supported by member states through annual contracts. Currently nine state departments of fish and game and one independent research organization are supporting it.

Official registration at the 3-day meeting numbered 49: 10 of these were members of the staff or students at the Institute of Statistics, North Carolina State College. My participation, along with a number of other people, was as a guest and observer.

Twenty-nine distinct organizations were represented: 18 were state departments of fish and game. Also represented were such United States governmental agencies as the Atomic Energy Commission, Bureau of Commercial Fisheries, Bureau of Sport Fisheries and Wildlife and Forestry.

Two of the three formal lectures presented material with a direct bearing on our marine creel survey problems. Professor A.L. Finkner presented a comprehensive, yet succinct review of "Sample Survey Techniques." He also expounded on "Special Estimating Techniques," such as ratio and regression estimation and unequal probability selection. Professor C.H. Proctor spoke on "Scatter, Stability and Vigilance in the Response Errors of Factual Surveys." One of the significant factors resulting from this study conducted on North Carolina Farms, was that an official or semi-official approach yielded slightly better responses (i.e. with less error) than a friendly approach.

The third talk, by Professor L. McKee, on computers failed, at least for me, to say anything of material value. He took an abnormally long time to say that computers can not do everything. Perhaps his most significant contribution was that investigators should set up independent tests to check on the validity of the results turned out by a computerized program.

The workshop phase of the meeting concentrated on a number of technical points expressed by the speakers, with particular emphasis on methodology which is not well known or established. Topics under discussion included systematic sampling, instantaneous counts, use of airplanes, ratio estimates, sampling proportional to size, equal and unequal probability sampling, fishing quality, use of the values derived from a survey, cost of surveys, etc.

The following techniques and methods shed light on, or appeared as though they may be useful in our marine censusing work: (1) instantaneous counts (the basic principle of this technique is that it is a rate and is treated as such in the mathematical computations),

(2) ratio estimation, (3) sampling proportional to size, (4) equal and unequal probability sampling (these latter three items appeared promising as cost reducing techniques but they require substantial background information, at least the data from one year's survey), (5) completed trip data (this is the preferred form but several states are using incomplete trip information plus instantaneous counts to make their estimates of effort and success).

Many states sample at a very low level - primarily as a surveillance tool, and use short intensive surveys in problem areas or for special purposes. This approach may be useful to us in the future, after we have established a base.

The "official attitude" is gaining over the "friendly approach," but a mixture of the two is the most popular, i.e. field samplers wear uniforms and patches. In this regard, several states found that name plates were beneficial. Organizations using wardens as census clerks were experiencing problems because of the conflict of interest created when a violation is encountered.

Off-the-record discussions were also fruitful as well as illuminating. For example, William Kelly of New York has successfully marked trout with a dye. After 8 months the subcutaneous marks are as vivid as newly-injected specimens. Mr. Hester and graduate students at North Carolina State College have succeeded in producing various hybrid fish involving the crossing of generic lines. Although this is artificial, sportsmen and biologists may soon be face to face with these beasts. Mr. Hester is also seeking methods to extend the spawning period--he can now keep males (species ?) in a continuously ripe condition and induce females to spawn almost at will.

Dr. Tom Linton, Saplo Island, Georgia, discovered that shrimp (Penaeidae) are sensitive to very small changes in atmospheric pressure. Investigating the expression "running legs" used by Georgia shrimp fishermen to describe a condition in the fishery, he found that this phenomenon occured just prior to the onset of storms or hurricanes and that the shrimp were on the move. Dr. Linton was able to reproduce the running leg condition (i.e. a change in leg color) in the laboratory by lowering the atmospheric pressure in their containers. A paper or note is forthcoming.

Professor Don Hayne has and is influencing creel survey activities over a wide geographical area of the United States, not only in the South but also in such states as Wisconsin, Michigan, and Connecticut.

Two sets of the papers presented at the meeting are available: one at the Terminal Island Library and one at Sacramento. --- Leo Pinkas

CSFL LIBRARY
ANNUAL REPORT, 1964

Sustained national interest in the ocean, its biological and physical resources continues to be reflected in the steady growth of literature relating to this field, and in the flood of letters, phone calls and visitors to the library seeking information on these subjects. Statistics showing this phase of the library's use are considerably higher than in previous years, and distribution of the Department's marine publications has jumped.

A review of the figures showing the library's acquisitions revealed an interesting growth pattern. Between 1917 and 1946 the total number of publications received was listed as 22,041. The count as of December 31, 1964 was 109,484. This means 97,443 have been added in the past eighteen years or better than 80% of the entire collection. In 1964 we received 8,773 publications. Our current count of serials received is 1,124. These figures include very few duplicate titles as it has not been our policy to acquire or keep duplicates. Nor do they include gifts or the material in the Menlo Park branch library. Library shelves, implemented and shifted a year ago are again crowded to capacity.

Mrs. Laura Richardson became a valued addition to the library staff, filling the Intermediate Steno Clerk position formerly held by Mrs. Gwen Cody. Mrs. Sally Gogin, Librarian II was appointed in July for six months. She has been cataloging our backlog of publications and serial holdings.

Two students, Miss Joanne Affrunti from Immaculate Heart Library School and Miss Frances Taylor, University of Southern California Library School chose this library for their practice study.

Three hundred volumes were prepared and sent out for binding - We have added a 3M Microfilm Reader-Printer and Micro-Card reader to the library. These will make out-of-print or rare material more accessible to the research staff.

Library assistance continues to be given to the Menlo Park Laboratory. The librarian visits there once a month to help with their library problems. The project to have Terminal Island library card catalog copied so this collection can be made more available, to the Menlo Park staff, has been instigated. After careful consideration, we decided to adopt the book catalog over microfilm or Xerox methods and are negotiating a contract with Econolist to do the work.

The Librarian attended all monthly meetings of the Special Libraries Association and the annual meeting of the California Library Association. She acted as member of the Advisory Council of the Southern California Chapter of the Special Libraries Association. Other meetings attended were the Tuna, EPOC and CCOFI Conferences at Lake Arrowhead. She gave two talks to the

Immaculate Heart College, School of Library Science on the acquisition of library materials. Also, she assisted in setting-up and getting into operation the Oceanic Coordinate Index of the Mission Bay Research Foundation.

In addition to running the library, the work of handling of all Marine Resources Departmental publications as been done by library staff, including quarterly and annual inventories. The Fish Bulletin mailing list was revised and over 300 new additions were made. Fish Bulletins 124, 125 and 126 were mailed to all exchange institutions and individuals. All letters, phone calls and requests in person for Departmental publications were serviced. A casual count of people other than staff workers who used the library in 1964 totals 1068. Accurate figures are difficult to keep because of work pressures. An attempt to determine the staff use of the library led to placing a photo-electric cell at one door and securing the other entrance for certain periods of the day. Several afternoons, chosen at random gave an average record of twenty per hour. This does not mean all twenty made reference use of the collection, but it does show a heavy traffic flow by staff into the library. Most of the staff are well acquainted with the library collection and do their own reference work, however, twenty people per hour coming into the library places a heavy demand on the time of library personnel. This rate of library use is not the exception, but is becoming the average pattern, especially from 1330 - 1630.

STATISTICS - LIBRARY

Acquisitions	8173
Reference (by the public)	1068
Interlibrary Loans	97
Photocopy (pages)	1850
Binding	300
Cataloging - items	650
Cards typed and filed	4400

Statistics - Public Information Service

Publications distributed	10,576
Visitors	826
Phone requests	1,052
Letters	1,395
Mailing lists additions	300
Films - shown	74
Viewers	3,500

----- P. Patricia Powell

1. BOTTOMFISH

A. Fishery

Flatfish: The fleet fished between 20 and 300 fathoms with good success; dover in deeps off Eureka, Bodega Bay and Montara; petrale in quantity in deep water north of Fort Bragg; and English from shallow water off Santa Barbara and San Francisco.

Rockfish: Catches increased over last month. Eureka landings were comprised of channel rockfish, canary, black and yellowtail rockfish. Bocaccio and chilipepper led at other ports.

B. Research

Flatfish: Landings were routinely sampled at all major ports. Trawler logs and tickets were collated and coded. Tag returns from 1963 and 1964 releases were monitored. Most returns were from 1964 petrale tagging off central California. Twenty-five tags were taken by a Fort Bragg trawler during several days' fishing off Mendocino County. The fish were apparently congregated for spawning. Several petrale were recaptured by the San Francisco fleet. An English sole, tagged in 1963 off Santa Barbara, was recaptured off Morro Bay.

Liaison was maintained with Humboldt State College on the petrale sole embryological study. One attempt to hatch eggs was a failure. Another trial is in progress.

A method was developed to project Monterey English sole interopercle bones for aging and measurement. Two observers agreed well on readings of two-thirds of the bones.

Rockfish: Landings by port for 1964 were compiled to determine the extent to which rockfish are being classified by the receiving markets. Of all rockfish landed, 33 percent was unclassified but some ports listed less than 10 percent in that manner. Ports where a large proportion is "unclassified" will be canvassed in the near future in an endeavor to obtain better statistics.

The project is behind schedule. An Aquatic Biologist I position has been vacant since September, 1964.

2. SHELLFISH

A. Fishery

Abalone: Season closed.

Crab: Landings at San Francisco totaled 559,019 lbs. through December - only slightly more than the November-December

total of 1961-62 when San Francisco experienced the worst season on record. Fishermen report, however, that catches have not declined as drastically after the first two months as they did that year. Eureka landings totaled 379,852 lbs. during December; reports from dealers and preliminary ticket totals show more than 2 million pounds has been landed this season in that area.

Oysters: Pollution caused by floods has prevented harvesting in Humboldt Bay. It will probably be another month before oysters can be taken from these northern most California oyster beds. Production from Drakes Estero, Tomales Bay, and Morro Bay continued strong.

Shrimp: Season closed.

B. Research

Abalone: A diagramatic plan of facilities for the proposed Shellfish rearing laboratory and a suggested exterior elevation of the building were prepared for inclusion in the prospectus for the laboratory.

Project personnel took part in an underwater communication demonstration of equipment manufactured by Aquasonics Corporation.

Biostatistics section and project personnel met to make preliminary analysis of new survey techniques used in December on abalone beds near Cambria. Planning for future surveys was discussed.

Crab: Returns from crab tagged in Humboldt Bay show movement from the Bay into surrounding waters. It is anticipated that suture-tagged sublegals will appear in the commercial harvest in 1965-66. Ninety-six crabs were tagged and released during February. Research continued on larval abundance and on mating success of male crabs in the Gulf of the Forallones.

Oyster: Samples of oysters from beds being harvested were taken to determine fitness. This is expressed as a condition factor (meat to shell cavity ratio) which reveals seasonal variations of meat cultured in the several oyster growing areas.

The inspection of seed oysters in Japan began in the seed packing sites near Sendai on February 13. Seed is in high demand and low quantity. About 8,000 cases will be inspected for California growers. The biologists' tour of inspection in Japan will end about March 10.

Shrimp: Preparations for the spring cruise off northern California are underway. Special random sampling boxes for

shrimp catches have been constructed, sampling stations selected, and "snag" charts brought up-to-date. A refinement of the random selection of sampling stations has been the elimination of snag locations from the selection.

The program is on schedule.

3. POINT ARGUELLO SURVEY

The project is now in the report writing stage. One week was spent at the BCF laboratory at La Jolla conferring with Dr. Ahlstrom on plans for integration of the final reports of the two agencies.

The project is proceeding on schedule.

4. PELAGIC FISH

A. Fishery

Landings in tons	February		January 1-Feb. 28		
Species	1965*	1964	1965*	1964	10 yr. mean 1954-1963
Anchovy	36	29	70	203	2,408
Mackerel, jack	1,565	1,543	1,835	1,592	5,754
Mackerel, Pacific	10	221	15	372	2,252
Sardines	60	166	96	229	944
Squid	170	499	520	980	873

* Estimated (minimum) landings based on contact with the industry.

The southern California mackerel and sardine fleet was tied-up during most of February due to price disputes over mackerel and differences between unions. Differences were resolved by February 22 with a final agreement of $55 per ton for mackerel; cannery limits of 60 tons with boat transfers liberalized to 25 tons or less (one transfer per boat). Sardines remained at $65 per ton.

Central California landings were extremely poor, accounting for only 10 percent of the statewide total. Most of this was jack mackerel caught between San Simeon and Pt. Piños. Foul weather prevented fishing February 4-9.

Most southern California landings were made after settlement of the price dispute. Jack mackerel catches contained some sardines, Pacific mackerel and bonito. Chief areas of catch were Catalina Island, San Clemente Island and the Oceanside area. Market demand for Pacific mackerel was such that men sorted through mixed catches to salvage as much as possible.

Live Bait: Although still relatively inactive six boats reported 14,300 scoops (Aug. 12 lbs. per scoop) sold in January. Most of this was 0 and 1 ring fish from the Los Angeles - Long Beach harbor area. Catches from Port Hueneme and San Diego were predominately 1 and 2 years old.

Research

Routine sampling, scale and otolith reading, and preparation of sardine and Pacific mackerel age composition manuscripts combined to absorb most of the research effort.

Live bait logs for 1964 were edited and are ready for key-punching and later analysis.

Special thermometers were loaned to four live bait fishermen who are cooperating with us by recording sea surface temperatures wherever they catch bait. This data will aid in understanding the relationship between water temperature and bait distribution.

Sea Survey: No cruises scheduled.

Our principle effort continues to be directed toward the production of data reports for past year's survey cruises. Coding of 1952 data was completed and sent to Biostatistics for keypunching; coding of 1954 data was nearing completion at months end. Data for 1950, 1951, and 1955 have previously been coded.

A "final" computer run of the 1955 data was made, but some difficulties manifested themselves and part of the year will have to be rerun. The 1955 data will be ready for the production of a finished data report during March. This will be the first of a series encompassing 15 years of sea survey cruises.

Program is on schedule.

5. TUNA

A. Fishery

There was no albacore or bluefin tuna fishing this month. The high seas fleet harvested yellowfin and skipjack off southern Mexico and Central and South America; the local fleet turned to "wet fish" late in February, after price disputes were settled.

B. Research

Since there was very little field activity, we were able to devote some time to processing age composition and logbook data accumulated during last fishing season, and to complete a program perspective.

A manuscript describing the results of a study of tuna eye lens proteins received preliminary editing and has been submitted to the Quarterly.

We worked on a cooperative tuna-marlin tagging trip with Mission Bay Research Foundation personnel, in the vicinity of Cape San Lucas, Baja California. No tuna were seen or caught, but 85 of the 123 striped marlin caught were successfully marked and released during the two-week cruise.

C. Miscellaneous

Five staff members from MRO and one from MRB attended the Fifth Government-Industry Tuna Meeting held in San Diego February 18 and 19. This meeting provides an opportunity for representatives from the scientific world, the State Department, and the fishing industry to discuss their views informally and to make recommendations concerning tuna.

On the first day, the Inter-American Tropical Tuna Commission staff reviewed the status of the eastern Pacific Yellowfin fishery. Again this year they pointed out the necessity for limiting the catch, if a high level harvest is to be maintained. However, agreement among all nations concerned does not seem imminent.

The skipjack, which appears to be an underharvested resource was discussed during the second day. The consensus was that more work would be necessary before the full potential of this species could be realized.

Other interesting talks included an outline of a proposal called EASTROPAC for investigating the tropical Pacific east of longitude 140°W, between latitudes 30°N and 20°S, and a report on exploratory hake fishing using a midwater trawl by Lee Alverson, BCF, Seattle.

The meeting closed after a rather spirited, open-panel discussion of current problems.

D. Schedule

The project is proceeding, but it is well behind schedule due to a number of vacant positions: Bell is in Mombasa Kenya on an FAO assignment, Iselin is on educational leave at U.C.L.A., and Frey has been assigned full time to the planning project since January 1. This situation seems likely to continue for several months.

6. SPORTFISH

A. Partyboat

Research

Jack Schott departed for a 10-day trawl trip in the Ventura

area to tag California halibut. By the end of the month 150 fish had been tagged and measurements had been obtained on 450.

Fishery

The species composition of the January partyboat catch indicates widespread cold water. Barracuda, kelp bass and bonito catches amounted to 40 to 90 percent of the January 1965 landings. California halibut and rockfish catches were up 20 and 300 percent, respectively over January 1964. Three new partyboats under construction at Costa Mesa will be ready for the summer season. Hull lengths range from 75 to 85 feet. One of the 85-foot vessels has three engines; the investment in it is expected to be $200,000. The Happy Days III, landed 111 42-to 62-inch sturgeon in the Vallejo area during January.

Project is on schedule.

B. Environmental and Behavioral Studies of Coastal Sportfish (DJ F22R-1)

We completed field work on our contractual survey of the area around the Orange County seiner and began analyzing the data.

Field work was begun on our Survey of the Marine Environment Offshore of Point Loma, San Diego County. Diving stations were occupied at 20-foot depth intervals along two transects, running perpendicular to the shore, from 20 to 100-foot depths. At each station photographs were taken, estimates of the numbers and kinds of plants and animals made, and samples of the epibios removed from within a 1/4 meter quadrat.

We continued working on a manuscript entitled "Artificial Reef Ecology." A large section, discussing the invertebrates associated with these reefs, was received from the typist and will be proof-read preparatory to its submission to the editor.

Project divers obtained a sample of lobsters for length/weight determinations.

This project is on schedule.

C. Blue Rockfish Management Study (DJ F19R-4)

Serology studies of populations at Monterey and Princeton continued. Trapping of juvenile fish continued at Monterey and Santa Cruz. Juveniles are still being caught, but are considerably fewer in numbers than during the fall months. Maturity and fecundity studies are still underway. Seven tagged blue rockfish were speared at Monterey breakwater for growth study data.

The Field Guides for Common Ocean Sport Fishes are being revised. Several additional species will be included.

The author's proof of the Del Norte, Humboldt, and Mendocino counties fishing map was proof-read and returned to Sacramento.

The project is on schedule.

D. Southern California Marine Sport Fish Survey (DJ F20R)

We continued to gather and assess information for the formulation of a probability sampling plan to measure shoreline sportfishing activities during 1965. Toward this end, Leo Pinkas participated in a workshop meeting on creel surveys, at the Institute of Statistics, North Carolina State College. (Report on page 3) Ideas obtained there are now being examined in light of our problems.

Hardware to store topographic maps, which will be the backbone of our shoreline survey, was received and installed. The maps were organized and dutifully stored for easy access and reference.

Project personnel gathered effort, success, and biological data at the Greater Los Angeles Council of Skindivers annual species meet held on February 7 at Dana Cove Park, Dana Point. A report on the results of the meeting has been submitted and distributed.

The project is now two months behind schedule: in part due to the reasons listed in the January report; in part due to the complexity of the problem, and in part because James Thomas, Marine Biologist II, terminated early in the month. Jim is now with the U.S. Fish and Wildlife Service, Maine, studying lobsters.

7. SPECIAL PROJECTS

A. Southern California:

The first in a series of four sea otter aerial censuses planned for 1965 was flown on February 10. Details are available in Flight Report 65-2-Special Projects. The low count was 130, the high 149, with one of 131.

Work continued on the manuscript of a publication giving the results of the 6-year Santa Monica Bay Trawl Study.

Some time was spent attending meetings and working up recommendations for the method which will achieve maximum diffusion at the hot water outfall to be built offshore of Nuclear Power Plant planned for Corral Canyon, near Malibu.

Planning was begun for the exploratory fishing cruise scheduled for May. This included a discussion with Robert Lavenberg, L.A. County Museum.

Project is on schedule.

B. Northern California: An inoperative thermograph in Drakes Estero was replaced by a new one.

February 10, Mr. Larry Bressler of the Leslie Salt Company, J. Aplin, and P. Wild inspected sites for a fish trap in South San Francisco Bay slough on lands of the salt company. Wild, a graduate student at San Jose State College, is planning a study of fishes on a south bay slough.

The project is on schedule.

8. BIOSTATISTICS

A. Data Processing

Regular Reports:

Statistical reports summarizing the December landings and shipments were prepared.

The cannery and processor reports were completed and the letters summarizing the tuna and sardine case pack were distributed.

The November Pacific Mackerel III report for area 7 was completed.

The January marine partyboat catch during January was summarized and the letter reporting the catch was mailed.

Late 1964 partyboat logs were summarized.

A listing of the deliveries made by each boat during 1963 was prepared.

Special Reports:

A survey of the data processing now being done by Biostatistics was prepared and a summary of the results was sent to the administrative office for use by the Resources Agency EDP committee. In addition, a survey was conducted of the data collection activities of MRO. The information will be used by the committee to evaluate a possible "common data bank" to be used in conjunction with a large-scale computer system.

Reports summarizing 1963 bluefin log data were completed for Tuna.

A table of red abalone landings caught in selected origin programs was compiled for Keith Cox.

A table was prepared showing the 1964 landings and weight canned of sardine, anchovy, Pacific mackerel and jack mackerel.

Field:

All bait shops from Malibu to Dana Point, which handle inshore bait species, were contacted. Each dealer was issued a Southern California Block Origin Map; also their fish receipt books were cleared of 1964 receipts.

Other dealers and processors in southern California were contacted. Questions regarding boat numbers and species were answered to facilitate the editing of fish receipts. Also, special problems concerning the balancing of monthly processor reports to annual reports were resolved.

Work in Progress:

The annual processor reports are being edited prior to the publication of the circular.

February fish receipts are being edited.

Work is continuing on preparing the justification for obtaining a faster card sorting machine.

B. Technical Assistance and Biometrical Analysis

Statistical and Mathematical Analysis:

Development work on a two-stage sampling plan for estimating shrimp catch-per-haul and related standard errors was completed. Some work remains on the formula for allocating sampling effort between stages. This formula will yield the optimum relative sample sizes for the first and second stages given a fixed cost for a cruise.

Abalone survey procedures were discussed with Keith Cox.

Computers:

Two programs for generating random numbers to be used on the March shrimp cruise were under development. One program gives random haul locations within area strata in terms of latitude and longitude coordinates and rejects all locations that fall in known snag areas. The second program produces random numbers for sub-sampling the catches.

9. BIOLOGICAL NOTES

On February 16, a 30-foot gray whale washed ashore off Fort Ord in Monterey Bay. It had met its demise several weeks earlier. Cause of death could not be determined.

A young sea otter was seen by the NAUTILUS at 37°55N and 123°00W while conducting crab research. This point is 5 miles from the nearest land and more than 60 miles north of the present California range. The otter was apparently asleep, and the boat approached within 20 feet before it became alarmed and swam away from the boat on the surface of the water.

On February 21, a sport fisherman stopped by the laboratory with a live juvenile wolf eel for our inspection. He was also carrying his days catch from Trinidad pier. A close look revealed a kelp bass, Paralabrax clathratus. The fish was revived in an aquarium at the laboratory and is a welcome addition to our local fauna.

A black abalone with a red-colored shell, Haliotis cracherodii, recovered by Mr. E. Porter, a diver at Morro Bay, has been placed on exhibit at the Morro Bay Aquarium.

10. MISCELLANEOUS

A. Meetings, Talks and Visitors:

February 2 - Leo Pinkas spoke to the NOR-AIR Surffishing Club, 106 members present, on project activities and plans.

February 3 - Departmental hearing on oystering and public recreational use of Drakes Estero, (Orcutt, Dahlstrom).

February 4 - MRO staff meeting, CSFL.

February 5 - Roedel and Baxter, MRO, Janssen and Kaneen, R5, and Radovich, MRB, met at CSFL to develop a departmental recommendation regarding fishing at Catalina Island.

February 6 - Staff members presented biological information on crab in relation to size limits at the South Bay Conservation Club, Eureka. Roedel, Orcutt, Gotshall plus Region 1 personnel and Gates, participated.

February 9 - Gotshall met with Jack Robinson of Oregon Fish Commission in Crescent City to discuss the preparations for the 1965 shrimp season.

February 9 - Cox spoke on abalones to the Lockheed Skin Divers, Mt. View.

February 10 - Cox spoke on abalones to a SCUBA class at Stanford University.

February 10 - Carlisle met with Navy Commander Wm. Goode at Treasure Island, San Francisco to discuss planning and design of artificial reefs.

February 11 - Baxter participated in CalCOFI Committee meeting at La Jolla.

February 15 - Carlisle attended a meeting with Harold Bissell, Region 5 representatives and L.A. Department of Water and Power officials to discuss outfall design for the Corral Canyon Nuclear Power Plant, Los Angeles.

February 16-19- Blunt, Wood and Hyatt participated in a scale reading session at La Jolla.

February 17-19- Leo Pinkas participated in a Creel Survey workshop sponsored by the Department of Experimental Statistics, North Carolina State College, Raleigh, North Carolina. (See pages 3 and 4)

February 18 - Carlisle attended one afternoon session of the meetings on Nuclear Power Plant Siting, Los Angeles.

February 18 - Gotshall met with members of the Humboldt Bay Marketing Association and Captain Gray to discuss the proposed change in the method of measuring commercial crabs.

February 18-19- U.S. Government-Industry Tuna Meeting, San Diego, (Roedel, Best, Orcutt, Fitch, Phelan, Powell).

February 24-26- Roedel, Greenhood and Frey participated in a departmental planning meeting in Sacramento.

February 28 - Cox attended a meeting in San Luis Obispo to discuss abalone legislation with representatives of local sports groups.

B. Personnel:

February 3 - James C. Thomas, Marine Biologist II resigned.

Phil M. Roedel
Manager

jg/85

The Resources Agency of California
Department of Fish and Game
Marine Resources Operations

TUNA PROGRAM

Perspective

Tunas support one of the State's largest industries and annually provide many thousands of Californians with recreation and a livelihood. During the years 1958-1962, the American commercial fishing fleet produced an average of nearly 300 million pounds of tuna, bringing the fishermen some $38 million per year. In 1963, American consumers spent close to $250 million for about 20 million cases of tuna, and the demand has been increasing steadily.

Commercial privilege taxes on tuna (excluding levies on imports) bring approximately $170,000 per year to the Fish and Game Preservation Fund making tuna the largest commercial contributor.

Yellowfin tuna and skipjack are tropical species and comprise a year-round fishery. The fleet is composed of over 170 seiners and biat boats, which ply the coastal waters from Baja California to northern Chile. Albacore and bluefin tuna are temperate species. The albacore fleet numbers well over 1,000 troll and bait boats, which operate along the coast from central Baja California to Alaska. Bluefin (and some albacore) are harvested by purse seiners; these total nearly 150, and may range from southern Baja California to the Columbia River.

The history of tropical tuna fishing is marked by constant expansion and an increase in the exploitation rate. At present, yellowfin stocks are believed to be fished at a rate higher than that which will permit a maximum sustainable yield; while skipjack are not. Because of their distribution, these two seldom are caught by California sportsmen.

The temperate species are harvested seasonally, and our fishermen depend upon an annual migration. As a result, the fisheries are erratic and the catches fluctuate very widely at times. Present studies indicate that the albacore and bluefin tuna stocks are in good shape, although considerable research remains to be done. These species are among the most important to California sportfishermen; for example; some 82,000 angler-days (225 man-years) were spent fishing for albacore during the 1962 season.

Agencies in the eastern Pacific most concerned with tropical tuna research are the Inter-American Tropical Tuna Commission, USFWS Bureau of Commercial Fisheries, and Scripps Institution of Oceanography. The IATTC is advocating regulation of the yellowfin catch; at its 1964 meeting, Commission members (Costa Rica, Ecuador, Panama, Mexico and United States) recommended a 77,000 ton bag limit.

Prepared by Harold B. Clemens, January 1965

Those most concerned with temperate tuna research are the California Department of Fish and Game, USFWS Bureau of Commercial Fisheries, Oregon Fish Commission, and various Japanese agencies. The work performed is coordinated through annual conferences, and duplication of effort is minimized.

The Department's tuna staff is concentrating on the temperate species (albacore and bluefin tuna), both of which enjoy a Pacific-wide distribution and are harvested primarily by fishermen from Japan and the U. S.

OBJECTIVES

The tuna program has several major objectives:

A. To conduct research designed primarily to provide basic information useful for guidance in managing the albacore and bluefin tuna resources, to insure an optimum harvest.

B. Use research results to improve the fishery; for example, by predicting the locale of seasonal migration.

C. Make the facts obtained through research known to all interested parties.

Reaching these objectives requires that we determine number, geographic location and extent, and size of the albacore and bluefin tuna populations contributing to California's fisheries, and that we understand the habits of the species and the dynamics of each population so they can be adequately utilized. This entails international cooperation and planning.

ALBACORE PROJECT

Purpose: Investigate the albacore resource inhabiting the North Pacific Ocean, with emphasis on that portion annually migrating into the eastern Pacific grounds and harvested by California fishermen.

Procedure: Our approach is to:

(1) Determine if more than one population exists by using, at present, electrophoretic techniques.

(2) Estimate the relative magnitude (number and pounds) of the migration and eventually the population, through catch analysis.

(3) Calculate the age and size composition of the migration and eventually the population, by interpreting annuli on albacore scales.

(4) Estimate exploitation rates through tagging methods.

(5) Document changes in location of the most productive fishing grounds and variations within the oceanographic environment, and reveal the inter-relationships, through catch analysis and research cruises.

(6) Record and interpret changes in the migration as determined through catch analysis, tagging, and exploratory fishing.

(7) Conduct pre-season exploratory fishing and oceanographic cruises.

(8) Study albacore physiology to determine the function of the pineal apparatus and what behavior role it plays.

(9) Conduct such miscellaneous investigations of food habits, parasites, and tuna larvae as time and circumstances permit.

Current Studies. The following are in progress:

(1) Population identification -- The albacore population structure has not been completely determined. Early biometric studies indicated there might be several populations in the North Pacific, while more recent tagging results point to only one.

At present we are operating under the one-population assumption, while conducting additional research in this field. Recent work has demonstrated that electrophoresis of hemoglobin and eye-lens proteins is a practicable way to resolve population questions, and we plan to continue using this new tool in hope of solving the problem. Two papers have been published and a third, describing recent progress, has received preliminary editing and will be submitted for publication in 1965.

(2) Migration and population magnitude -- Processing annual albacore catch statistics from commercial fishermen's logbooks and "pink tickets" is now automated. A Univac 1107 program has been designed to edit and compute daily catch in numbers and weight by matching logs and pink tickets, estimate total fleet catch and effort by one-degree squares by month, summarize the data, and print tabulations. Similar statistics are obtained from California's party-boat fleet; these are processed and tabulated by business machine (IBM). We depend heavily upon catch statistics from many hundreds of vessels for estimating migration size, etc. Fishing efficiency, however, may vary significantly between vessels, requiring certain adjustments in the data. Studies of fishing efficiency are in progress.

Sport and commercial catch statistics from 1916 through 1961 have been analyzed and will appear in Fish Bulletin 128.

(3) Age and size composition -- We have succeeded in determining albacore age by reading their scales, and now we routinely calculate the age and size composition of the California migration. These data, are integrated with logbook information, and provide estimates of the contribution made by various year-classes to California's fishery.

The age composition of the catch for years 1960 through 1964 has been determined, and a manuscript received for preliminary editing.

(4) Exploitation rates -- Thanks to the cooperation of the Mission Bay Research Foundation, information about exploitation rates is being obtained each season. The MBRF provides the vessels DORSAL and SEASCO for these tagging operations.

(5) Albacore - Oceanography -- Commercial catches (2) have been related to sea-surface temperatures obtained from Scripps pier, from CCOFI cruises, and from cruises of the N. B. SCOFIELD for the period 1951-1961 inclusive. These data have been analyzed and will appear in bulletin 128. To improve the fishery, we plan to continue our attempts at predicting the location of seasonal albacore "runs"; at present, predictions are based on subjective estimates of seasonally advancing isotherms.

(6) Migrations -- Although we have no full-scale tagging program, albacore captured on pre-season cruises aboard the N. B. SCOFIELD and during the season aboard Mission Bay Research Foundation vessels, are marked and released. These operations also enable us to obtain supplemental information regarding population structure (1) and age and growth (3).

(7) Pre-season cruises -- For the past several years, we have conducted exploratory fishing and oceanographic cruises in cooperation with the BCF Tuna Resources Laboratory. Major objectives are to chart the albacore migration into our fishing grounds, to correlate their appearance with sea conditions, and to relay these data to the fleet. This work is integrated with and supplements oceanographic studies (5). A cooperative publication is planned for the near future.

(8) Physiology -- We hypothesize that photoperiodism involving the albacore's light-receptive "pineal apparatus" plays a part in the timing of annual migrations. We also speculate that photoperiodic stimulation participates in activating the albacore's endocrine glands. If so, the onset of spawning etc. would be affected. A preliminary study describing the apparatus and discussing its probable function is now underway; a report has been received for editing, and it will be submitted for publication in 1965.

(9) Miscellaneous -- This category includes several important studies that are pursued when we find an extra few moments:

(a) Food habits -- Organisms found in albacore stomachs are identified and listed by number of individuals. These data supplement studies of important fishing grounds by adding to our knowledge of albacore behavior. We plan to continue such studies and report when appropriate.

(b) Parasites -- These are collected and sent to leading parasitologists for identification. We hope to determine the role they play in albacore life history. This work will be continued, and reports will be prepared when timely.

(c) Larvae identification -- We collected a series of tuna and tuna-like larvae during several cruises off central America and South America from 1951-1959. They will be identified, as opportunity arises, and thus add to our knowledge of tuna spawning habits.

BLUEFIN TUNA PROJECT

Purpose: Investigate the bluefin resource inhabiting the North Pacific Ocean with emphasis on that portion annually migrating into the eastern Pacific grounds and harvested by California fishermen.

Procedure: Our approach is essentially the same as reported in the albacore section, except for item (7); no pre-season exploratory fishing and oceanographic cruises are conducted.

Current studies: The following are in progress:

(1) Population identification -- We are studying bluefin hemoglobin and eye lens proteins (by electrophoresis) to determine if more than one population exists in the north Pacific. A manuscript describing one phase of this investigation has been received for preliminary editing. Plans are to continue work until the answers are found.

(2) Migration and population size -- Processing annual bluefin catch statistics from commercial fishermen's logbooks, party-boat records, and pink tickets is now handled by business machines (IBM). Sport and commercial catch statistics for the period 1960-1963, are being analyzed at present. A large amount of data extending back to 1950 await analysis; plans are to keep up with current work and tackle the backlog as time permits. We rely on catch statistics from numerous fishing vessels for estimating migration size, etc; since fishing efficiency varies significantly between vessels, suitable adjustments are made.

(3) Age and size composition -- We have succeeded in determining bluefin tuna age, and the age and size composition of the California commercial catch has been calculated routinely since 1963. A manuscript has been received for preliminary editing. Also, a weight-length relationship is calculated for each season to see if significant fishery independent changes occur, and to convert pounds caught by the fleet to number of fish.

(4) Exploitation rates -- Information concerning exploitation rates is obtained seasonally. This is accomplished through a cooperative tagging project which includes the MBRF: BCF, and DFG.

(5) Bluefin - oceanography -- Oceanographic data that may be related to the occurrence of bluefin are accummulated as time permits, along with detailed information concerning seasonal variation in location of the most productive fishing grounds (2).

(6) Migrations -- Two coordinated tagging studies are underway. The first is cooperative with the BCF Tuna Resources Laboratory. The second is cooperative tagging with the Mission Bay Research Foundation and BCF. The Foundation supplies the vessels and is paid for the fish under a BCF contract. We plan to continue these activities, and to collaborate on reports from time to time.

(7) No pre-season cruises are conducted for bluefin tuna.

(8) Physiology -- Here, as in albacore, we are interested in the "pineal apparatus" and plan to start work as early as practicable.

(9) Miscellaneous -- The following studies progress as time permits

(a) Food habits -- same as in albacore.

(b) Parasites -- same as in albacore.

(c) Larvae identification and spawning -- Extensive collecting in the eastern Pacific during the past 15 years has not produced bluefin larvae. They have been reported in the central and western Pacific, however, and we plan to keep abreast of all work in this field.

Discussion

After considerable study, the tuna research program was reorganized in 1959. Field investigations of the yellowfin tuna and skipjack resources were discontinued, while efforts on albacore and bluefin tuna were stepped up. At the same time, program emphasis was

shifted toward analysis, to handle the large backlog of data on hand concerning all four species. This was made possible by sacrificing a permanent MB I position and two months of Seasonal Aid time, to obtain enough money for the necessary upgrading of key positions.

Significant progress has been realized. The backlog of yellowfin tuna and skipjack data (except for length-frequencies) was processed, analyzed, and the results reported; the backlog of albacore data also was taken care of, and some headway has been made toward processing the bluefin tuna data.

Reorganization also paid off in other important ways. For example, upgrading positions resulted in slowing the turn-over rate in tuna personnel. This meant that we were no longer faced with constantly diverting time and effort away from research to train new biologists, and that additional skilled man hours were applied each year to the primary tasks. In addition, time was available for developing computer programs to process a lot of our tuna data - thus increasing accuracy and efficiency.

Demand from the public and the industry for more knowledge about tuna resources constantly increases. More adequate funding of the research program (eg. with Bartlett Bill money) would allow the Department to make full use of the scientific talent and creative ideas possessed by its staff and to answer more adequately the questions asked of it.

STAFF: Harold B. Clemens, Marine Biologist IV, Tuna Program planning and direction, data analysis, editing, and publication.

William L. Craig, Marine Biologist III, Albacore Project leader, planning, data analysis, editing, and publication.

Herbert Frey, Marine Biologist II, Field Work Supervisor, data analysis, and sea cruises.

James E. Phelan, Aquatic Biologist I, albacore age analysis, logbook records, and sea cruises.

* Robert R. Bell, Marine Biologist III, Bluefin tuna project leader, planning, data analysis, editing, and publication.

* Robert A. Iselin, Marine Biologist II, Field Work Supervisor, data analysis, and sea cruises.

Robert T. Koski, Aquatic Biologist I, bluefin age analysis, logbook records, and sea cruises.

John J. Seapin, Fish and Game Assistant, bluefin tuna data collection and summary, and sea cruises.

* Robert Bell is on loan to FAO for about a year, and Robert Iselin is on leave for about a year to complete his schooling.

The Resources Agency of California
Department of Fish and Game
Marine Resources Operations

SPORTFISH PROGRAM
PARTYBOAT PROJECT

Perspective

The California partyboat fleet continues to upgrade boats, service and landing facilities. During the last several years, many new sportfishers have been designed and built for marine sportfishing. New boats are to be found at Monterey, Santa Barbara, San Pedro, Long Beach, Newport Beach, San Clemente, Oceanside and San Diego. New landing facilities, often with restaurants, have appeared in these ports. The total number of boats in the fishery has decreased. There were 377 active boats in 1963 as against a 17-year average of 472.

Partyboat angler-day totals have varied around a half million annually, 1947-1960. However, a change in counting methods (1961) has started to yield 0.6 million anglers because our counts now show number of fishermen, not fishermen days as before.

Fishing gear improves constantly, and the day of the calcutta "pole" has almost vanished, except on anchored barges --- even here "poles" are rare.

Game fish populations have held up very well, maintaining the fishery in southern California in high productivity. Record catches of barracuda occurred in 1959; bonito, 1964; albacore, 1962; and kelp and sand bass in 1963. In northern California, rockfish have been the mainstay of the fishery, except in the San Francisco Bay and delta areas, where salmon and striped bass predominate. Approximately 92,000 salmon were landed from partyboats in 1964, the best year since 1956.

Over-all success has been about six fish per-man-day, 1957-1964.

OBJECTIVES

The broad objectives of the marine sportfishing project are to:

1. Thoroughly document fishing intensity and relative success of the party boat fleet as it applies to the numerous species and groups of fishes under exploitation.

2. Conduct such special studies and life history investigations, within reach of the men and time available, as are needed to elucidate the statistical picture.

Prepared by Parke Young, January 1964,
revised February 1965

PROGRAM

Partyboat logs

Partyboat logs were devised to implement objective 1. Log books are of two types, one adapted for fish species typically southern in origin, and one adapted for central and northern California species. In 1962, the boats in the partyboat fleet were equally divided between the two areas, although angler counts were almost four to one respectively.

1. Efforts to improve the distribution, effectiveness and acceptance of logs are unceasing. Recently, improvements have been incorporated in all three areas. In 1964, log books were enclosed in a vinyl cover. The cover face bears full instructions to the skipper. We expect the log system will operate with the highest efficiency yet attained.

2. Partyboat delinquent lists will be prepared and distributed to all marine wardens as needed. Aggravated delinquencies will receive special attention, involving project personnel and/or wardens.

3. All logs will be carefully edited by a project biologist. The biostatistical analysis section agrees that machine editing is not applicable to our partyboat logs.

4. Monthly and annual catch summaries will be prepared and sent to all partyboat skippers, selected wardens and interested persons.

Biology

1. Age and growth studies of California halibut remain to be completed -- probably in 1966.

2. A halibut tagging analysis is contemplated in the near future, although more tagging is scheduled in 1965.

3. Determination of the age-length frequency distribution of kelp bass in selected areas is scheduled in 1965. Repetitive examination of this phenomenon shows, in part, the effect of the 12-inch size limit.

Publications

1. Three papers were published in CF&G in 1964.

2. The first draft of a marine partyboat catch bulletin is under preparation and may be submitted in 1965.

3. A California halibut age and growth study is scheduled for publication, probably in 1966.